

**GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD**

(An Autonomous Institute of Government of Maharashtra)

**Department of Computer Science & Engineering**

Teaching and Evaluation Scheme

**T.E.(Full Time) in Computer Science &Engineering**

Effective from academic year 2014-15

**SEMESTER-I**

<b>THEORY COURSES</b>													
S. No.	Course Code	Subject	PO	Scheme of Teaching (Hrs/Week)			Total Credits	Scheme of Evaluation (Marks)					
				L	T	P		Theory			Term Work	Practical/Viva-voce	Total
								Test	TA	ESE			
1	CS341	Computer Organization & Architecture	4,9	03	-	-	03	20	20	60	-	-	100
2	CS342	Design and Analysis of Algorithm	1,2,4,10,12	03	01	-	04	20	20	60	-	-	100
3	CS343	Theory of Computation	1,3,5,12	03	01	-	04	20	20	60	-	-	100
4	CS344	Software Engineering	1,2,3,4,5,9,10	03	01	-	04	20	20	60	-	-	100
5	CS345	Operating System	1,2,8,9,10	04	-	-	04	20	20	60	-	-	100
<b>LABORATORY COURSES</b>													
1	CS346	Lab Open Source Technology	3,9,10	-	-	02	01	-	-	-	25	25	50
2	CS347	Lab Design and analysis of Algorithm	1,2,3,5	-	-	02	01	-	-	-	25	25	50
3	CS348	Lab Programming in Java	2,5,9	1	-	04	02	-	-	-	50	50	100
4	CS349	Lab Operating System	1,2,8,10,12	-	-	02	01	-	-	-	25	25	50
<b>(A) Total of Semester – I</b>				<b>17</b>	<b>03</b>	<b>10</b>	<b>24</b>	<b>100</b>	<b>100</b>	<b>300</b>	<b>125</b>	<b>125</b>	<b>750</b>

## SEMESTER-II

<b>THEORY COURSES</b>													
S. No.	Course Code	Subject		Scheme of Teaching (Hrs/Week)			Total Credits	Scheme of Evaluation (Marks)					
				L	T	P		Theory			Term Work	Practical /Viva-voce	Total
								Test	TA	ESE			
1	CS350	Computer Network	1,2,3,4,5	03	01	-	04	20	20	60	-	-	100
2	CS351	Image Processing	1,2,4,6,10,12	04	-	-	04	20	20	60	-	-	100
3	CS352	System Programming and Compiler Construction	1,2,3,5,9,10	03	01	-	04	20	20	60	-	-	100
4	CS353	Data Mining & Warehousing	3,4,10,12	03	01	-	04	20	20	60	-	-	100
5	CS354	Professional Ethics and Cyber Laws	1,2,3,4,5,6,8,10,11,12	03	01	-	04	20	20	60	-	-	100
<b>LABORATORY COURSES</b>													
1	CS355	Lab Application Development Tools	3,7,10,11	02	-	02	01	-	-	-	50	50	100
2	CS356	Lab Computer Network	1,2,3,5	-	-	02	01				25	25	50
3	CS357	Lab Image Processing	1,2,4,12	-	-	02	01	-			25	25	50
4	CS358	Lab Data Mining & Warehousing	1,4,6,10,11,12	-	-	02	01	-	-	-	25	25	50
<b>( B) Total of Semester- II</b>				<b>18</b>	<b>04</b>	<b>08</b>	<b>24</b>	<b>100</b>	<b>100</b>	<b>300</b>	<b>125</b>	<b>125</b>	<b>750</b>
<b>Grand Total = (A) + (B)</b>				<b>35</b>	<b>07</b>	<b>18</b>	<b>48</b>	<b>200</b>	<b>200</b>	<b>600</b>	<b>250</b>	<b>250</b>	<b>1500</b>

*L-Lectures, T-Tutorials, P-Practical, TA-Teacher Assessment, ESE-End-Semester Examination*

## CS 341: Computer Organization & Architecture

### Teaching Scheme

Lectures 3 Hrs/Week

Total Credits 3

**Total Hours required for this course: 45 Hours.**

### Evaluation Scheme

Test 20 Marks

Teacher Assessment 20 Marks

End-Semester Examination 60 Marks

**Prerequisite:** Microprocessor & Interfacing

**Course Description:** Course includes basic machine architecture and design, digital logic circuits, digital components, central processing unit, machine representation of instructions and data, addressing techniques, memory organization, and execution of instructions at machine level.

### Course Educational Objectives:

- Illustrate the structure, function and characteristics of computer systems.
- Exhibit the design of the various functional units of digital computers
- Discuss different types of memories and their properties.
- Introduce basics of Parallel Computer Architecture.

### Course Outcomes Expected:

After completion of this course students will be able to:

CO1: Discuss working of functional components of computer (K1)

CO2: Demonstrate instruction execution cycle (K1)

CO3: Categories various memory types according to their properties.(K2)

CO4: Describe the principles of memory management.(K2)

CO5: Explain how interrupts are used to implement I/O control and data transfers.(K3)

### UNIT-1 Computer Evolution

Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Hardware architecture

### UNIT-2 Representation of Instructions

Bus Interconnection, Scalar Data Types, Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2's Complement method for multiplication, Booths Algorithm, Floating point representations, IEEE standards, Floating point arithmetic

### UNIT-3 The Central Processing Unit

Functions of CPU, instruction sets and Examples of instruction set, addressing schemes, instruction formats, instruction cycle and instruction pipelining, Hardwired control unit, Micro programmed control unit

### UNIT-4 Memory Organization

Characteristics of memory systems, Internal and External Memory, Types of memories: ROM: PROM, EPROM, EEPROM, RAM: SRAM, DRAM, SDRAM, RDRAM, High-Speed Memories: Cache Memory, elements of cache design, Pentium 4 cache ,Organization and Mapping Techniques, Replacement Algorithms, Cache Coherence, Secondary Storage: Magnetic Disk, Tape, DAT, RAID, Optical memory, CDROM, DVD, Error correction memories, Interleaved memories, Hardware support of memory management

#### UNIT-5 I/O Organization

Input/output devices, input/output interface, asynchronous data transfer, modes of data transfer, USB Ports Working mechanisms of Peripherals: Keyboard, Mouse, Scanners, Video Displays, Touch Screen panel, Dot Matrix, Desk-jet and Laser Printers.(features and principles)

#### TEXT BOOKS

1. W. Stallings, "Computer Organization and Architecture: Designing for performance", 6<sup>th</sup> Edition, Prentice Hall of India, 2003, ISBN 81 – 203 – 2962 – 7
2. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill, 2002, 5<sup>th</sup> edition ISBN 007-120411-3

#### REFERENCE BOOKS

- 1.D. Paterson, J. Hennessy, "Computer Organization and Design: The Hardware Software Interface", 2<sup>nd</sup> Edition, Morgan Kauffman, 2000 ISBN
2. John P. Hayes, Computer Architecture and Organization, McGraw Hill

#### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
				H					M			
CO1				H					M			
CO2				H					M			
CO3				H					M			
CO4				H					M			
CO5				H					M			

**H – High M – Medium L - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

- 1) Question answer based Theoretical Assignment
- 2) “ Think More Write Less” Based (observation based) Assignment
- 3) Power point presentation of Topic which is related but out of syllabus
- 4) Class room Question & answer
- 5) Overall approach towards learning, creativity.

#### Assessment Pattern



- Learn dynamic programming and backtracking.
- Use data structure in providing efficient algorithms solutions.

**Course Outcomes Expected:**

After completion of this course students will be able to:

- CO1: Describe asymptotic notation, its properties and use in measuring algorithm behavior.
- CO2: Apply mathematical principles to solve various problems
- CO3: Analyze and apply the complexities of various algorithms and select the best
- CO4: Know the different strategies that are known to be useful in finding efficient algorithms to solve problems and to be able to apply them.
- CO5: Use appropriate data structure and algorithms to solve a particular problem

**UNIT-1 DIVIDE-AND-CONQUER**

What is an algorithm, Performance Analysis- Space complexity, Time Complexity, Asymptotic Notation, and Divide-and-Conquer- Introduction, Binary Search-Iterative and Recursive, finding the Maximum and Minimum, Merge Sort, Quick Sort, Heap Sort.

**UNIT-2 GREEDY METHOD**

Introduction , 0/1 Knapsack Problem, Job scheduling, Huffman codes, Minimum cost spanning trees- Prim’s Algorithm, Kruskal’s Algorithm, Optimal Merge Patterns.

**UNIT-3 DYNAMIC PROGRAMMING**

Multistage Graphs, All pairs shortest path, single source shortest path, Optimal Binary Search tree, Traveling Sales man problem, Flow shop Scheduling.

**UNIT-4 BACK TRACKING**

Introduction, The 8 queens problem, Sum of Subset, Graph coloring, Hamiltonian cycles ,Branch and Bound

**UNIT-5 BASIC TRAVERSAL AND SEARCH TECHNIQUES**

Techniques for binary trees, Techniques for graphs- Breadth First Search and traversal, Depth First Search and traversal, Connected components and Spanning Trees.

**TEXT BOOKS**

1. Horowitz, Sahani, Rajasekaran, Fundamental of Computer Algorithm , Galgotia Publication
2. Coreman, Leiserson, Rivest, Stein, Introduction to Algorithms, PHI.

**REFERENCE BOOKS**

1. AhoUlman, Hopcroft, Design and Analysis of Algorithms, Addison Wesley

**Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		L								
CO2		M		H						M		L
CO3				H						H		L

CO4				H						H		L
CO5				H						H		L

**1 – High 2 – Medium 3 - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

- 1) Tutorials
- 2) Problem Solving
- 3) Power point presentation of case studies
- 4) Question & answer / Numerical solution

**Assessment Pattern**

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	10	10	25
K2	Understand	05	00	20
K3	Apply	05	10	15
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
<b>Total Marks 100</b>		20	20	60

**Assessment table**

Assessment Tool	K1	K2	K3	K1	K3
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	10	05	05	00	00
Teachers Assessment (20 Marks)	05	00	05	05	05
ESE Assessment (60 Marks)	15	20	10	10	05

**Special Instructions if any: Nil**

**Designed by**

- Mr. Sudhir G. Shikalpure
- Mrs. Meghana B. Nagori
- Mr. Pallavi Kulkarni

**CS 343: Theory of Computation**

**Teaching Scheme**

Lectures 3 Hrs/Week

**Evaluation Scheme**

Test 20 Marks

Tutorials 1 Hrs/Week  
Total Credits 4

Teacher Assessment 20 Marks  
End-Semester Examination 60 Marks

**Total Hours required for this course: 60 Hours.**

**Prerequisite:** Discrete Mathematical Structures

**Course Description:** This course provides a set of abstract structures that are useful for solving certain classes of problems. It describes properties and design methods and corresponding languages of Finite automata, pushdown automata and Turing machine.

**Course Educational Objectives:**

- Demonstrate different language processing abstract machines.
- Explain relationship between different languages and automata
- Illustrate string membership problems
- Design automata and language under specific criteria.

**Course Outcomes Expected:**

After completion of this course students will be able to:

CO1: Discuss properties of different grammars and languages (K1)

CO2: Solve problems related to string membership to an automata and respective Language. (K2)

CO3: Create grammar for specific language. (K3)

CO4: Identify language accepted by particular automata. (K2)

CO5: Design optimum automata for particular language (K3)

**UNIT-1** Automata: why study automata theory? Introduction to formal proof, Inductive Proofs, The central concept of automata theory.

Finite Automata: Deterministic Finite automata, Nondeterministic finite automata, An Application: Text Search, Finite automata with Epsilon – Transitions.

**UNIT-2** Regular Expressions and Languages: Regular expressions, Finite automata and regular expressions, Applications of regular expressions, Algebraic Laws for Regular Expressions

Properties of Regular Languages: Proving Languages not to be regular, Closure properties of regular Languages, Decision properties of Regular Languages, Equivalence and minimization of Automata.

**UNIT-3** Context Free Grammars and Languages: Context Free Grammars, parse Trees, Application of Context Free Grammars, Ambiguity in Grammars and languages.

Push Down Automata: Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automaton.

**UNIT-4** Properties of Context Free Languages: Normal Forms for Context Free Grammars, The pumping Lemma for context Free Languages, Closure Properties of Context Free Languages, and decision properties of CFL's.

**UNIT-5** Introduction to Turing Machine: Problems that computer cannot solve, The Turing Machine, Programming Techniques for Turing machines, Extensions to the basic Turing Machines, Turing machines and Computers, Undecidable Problems about Turing machines. An Introduction to intractable problems.

**TEXT BOOKS**

1. Hopcroft&Ullaman, Introduction to Automata Theory languages, and Computation 3rd edition. Pearson Education.
2. John C. Martin , Introduction to Languages and theory of computation 2<sup>nd</sup> edition TMH.

#### REFERENCE BOOKS

1. K.L.P.Mishra ,N. Chandrasekaran, Theory of Computer Science Automata, Languages and Computation) , 2<sup>nd</sup> Edition PHI

#### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	H		H		M							L
CO1	H											
CO2			H									
CO3												L
CO4					M							
CO5												L

**H – High M – Medium L - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

- 1) Question answer based Theoretical Assignment
- 2) “ Think More Write Less” Based (observation based) Assignment
- 3) Power point presentation of Topic which is related but out of syllabus
- 4) Class room Question & answer
- 5) Overall approach towards learning, creativity.

#### Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	10	05	15
K2	Understand	10	10	25
K3	Apply	00	05	20
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
<b>Total Marks 100</b>		20	20	60

#### Assessment table

Assessment Tool	K1	K2	K3	K2	K3
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	10	10	00	00	00
Teachers Assessment (20 Marks)	05	00	00	10	05
ESE Assessment (60 Marks)	15	20	10	05	10

**Special Instructions if any: Nil**

**Designed by**

- Mrs. Pallavi V. Kulkarni
- Mr. Meghana B. Nagori
- Mr. Nitin Dhutraj

### **CS344: Software Engineering**

#### **Teaching Scheme**

Lectures	3 Hrs/Week
Tutorials	1 Hrs/Week
Total Credits	3

#### **Evaluation Scheme**

Test	20 Marks
Teacher Assessment	20 Marks
End-Semester Examination	60 Marks

**Total Hours required for this course: 45 Hours.**

**Prerequisite:** Programming Language  
Data Structures  
Discrete Mathematical

**Course Description:** This course presents fundamentals of software engineering and process related activity for development of software product, this subject gives the knowledge of requirement engineering to collect required information appropriately from customer and maintaining the specification document and it also gives knowledge of design of software product. At the end it gives the idea about how to plan the testing for software product.

#### **Course Educational Objectives:**

1. Understand the processes involved in SDLC lifecycle.
2. Know the how requirement can be gathered through requirement engineering.
3. Learn the how to design the system and do the data mapping.
4. Recognize the importance of Golden Rules.
5. Learn the basic software testing strategy.

#### **Course Outcomes Expected:**

After completion of this course students will be able to:

- CO1: Aware of basic computer engineering concept through SDLC life cycle and Models in software engineering.
- CO2: Integrate the requirement from customer for software development.
- CO3: Apply the design concept to develop the system.

CO4: Apply the “Golden Rules” for user interface level design.

CO5: Formulate test strategy and ethically work to achieve the quality of product.

**UNIT-1 Introduction to Software Development process and Management**

Introduction to Software Engineering, Software Crisis and Myths, Software Development life cycle and Models: Maturity Model, Process models-waterfall, evolutionary, incremental etc, What is an agile view of process.

**UNIT-2 Requirements Engineering**

Requirements Engineering and Management. Initiating, Eliciting requirement, developing use cases, building the Analysis Model, Negotiating and Validating requirement.

**UNIT-3 An Architectural Design**

Software Architecture, Data Design, Architectural Styles and pattern, Architectural Design, Assessing alternative architectural Design Mapping Data flow in to software architecture

**UNIT-4 User Interface Level Design and Estimation**

The Golden rules, User Interface analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation, Project Estimation.

**UNIT-5 Introduction to Software Testing**

Test Strategies for conventional software, Validation testing, System Testing, The art of Debugging, Software testing fundamentals, Software quality, Framework for product Metrics.

**TEXT AND REFERENCE BOOKS**

1. Software Engineering – Practitioner Approach – Roger S. Pressman
2. Software Engineering by Ian Sommerville ; Pearson Edu
3. Object Oriented Analysis and Design, Grady Booch

**Assessment Pattern**

Assessment Pattern Level No.	Knowledge Level (According to Blooms Revised Taxonomy)	Test	Tech Quiz	Assignment	Case study	Presentation	End Semester Examination*
K2	Understand	20					20
K3	Apply		05			05	40
K4	Analyze				05		
K6	Create			05			
<b>Total</b>		20			20		60

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M								H			
CO2				H								

CO3		M	H								
CO4			M							H	
CO5					H					M	

High-H                      Medium-M      Low-L

Assessment Tool	K2	K3	K4	K5	K6
	CO1	CO2	CO3	CO4	CO5
Class Test (20 Marks)	10	10	00	00	00
Teachers Assessment (20 Marks)	02	03	05	05	05
ESE Assessment (60 Marks)	12	12	16	15	05

**Special Instructions if any: Nil**

**Designed by**

- Mr. Vikul J.Pawar
- Mrs. Vrushali A. Chakkarwar
- Mr. Prashant D. Pathak

<b>CS345: Operating Systems</b>			
<b>Teaching Scheme</b>		<b>Evaluation Scheme</b>	
Lectures	4Hrs/Week	Test	20 Marks
Tutorial		Teacher Assessment	20 Marks
Total Credits	4	End-Semester Examination	60 Marks
<p><b>Total Hours required for this course: 60 Hours.</b></p> <p><b>Prerequisites: Programming languages, Data Structures, Microprocessor peripherals and interfacing</b></p> <p><b>Course Description:</b> Topics will include what an operating system does ,management of the CPU, memory, processes and devices with exposure to android operating sytem.</p> <p><b>Course Educational Objectives:</b></p> <ul style="list-style-type: none"> <li>• Define and list the functions of an operating system.</li> <li>• list resources involved in process creation and management.</li> <li>• Explain the use of paging and segmentation</li> <li>• Explain the function and structure of the I/O system</li> <li>• Describe path names and directory structure visible to end users</li> </ul>			
<p><b>Course Outcomes :</b></p> <p>After completion of this course students will be able to:</p> <p style="padding-left: 40px;">At the end of the course the student will be able to</p> <p>CO1: Differentiate between multiprocessing, multiprogramming, and multitasking.</p> <p>CO2: Differentiate between programs, processes and threads.</p>			

CO3: Apply segmentation and paging techniques.

CO4: Compare file naming in Linux and Windows.

CO5: Awareness of Android Operating System

**Detailed Syllabus:**

<b>UNIT 1</b>	<b>Fundamentals of Operating System:-</b> OS services and Components, Multitasking , Multiprogramming, Multiprocessing Time Sharing, Buffering, Spooling, Distributed OS	
<b>Unit 2</b>	<b>Process and Thread Management</b> Concept of process and threads ,Process states ,Process management ,Context switching ,Interaction between processes and OS ,Multithreading, Example OS : Linux	
<b>Unit 3</b>	<b>Memory Management</b> Memory partitioning, Swapping, Paging ,Segmentation ,Virtual memory Overlays ,Demand paging ,Performance of Demand paging ,Virtual memory concepts ,Page replacement algorithms ,Allocation algorithms ,Example OS : Linux	
<b>Unit 4</b>	<b>I/O Systems</b> Secondary-Storage Structure, Disk structure ,Disk scheduling ,Disk management ,Swap-space management ,Disk reliability ,Stable storage implementation ,Introduction to clock ,Clock hardware ,Clock software	
<b>Unit 5</b>	<b>File systems</b> File concept ,File support ,Access methods ,Allocation methods ,Directory systems ,File protection ,Free space management Example OS : Linux Case study : Android OS	

**TEXT BOOKS:**

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts. Seventh edition. Addison-Wesley
2. Andrew Tanenbaum, Modern Operating Systems, Prentice Hall.

**REFERENCE BOOK:**

1. Operating Systems (5th Ed) – Internals and Design Principles By William Stallings, Prentice Hall
2. Operating Systems Achyut S. Godbole Tata Mc Graw Hill

**Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H								L			
CO2									M			
CO3	L	M								H		
CO4									M			

CO5								L	M			
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**H – High M – Medium L - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on the following :-

- 1) Assignment
- 2) PowerPoint Presentation
- 3) Quiz/Multiple choice questions test
- 4) Presentation of Case study

**Assessment Pattern**

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	10	00	15
K2	Understand	10	05	15
K3	Apply	00	10	20
K4	Analyze	00	05	10
K5	Evaluate	00	00	00
K6	Create	00	00	00
<b>Total Marks 100</b>		20	20	60

**Assessment table**

Assessment Tool	K1	K2	K3	K4
	CO1,CO2	CO1,CO2	CO3	CO4,C05
Class Test (20 Marks)	10	10	00	00
Teachers Assessment (20 Marks)		05	10	05
ESE Assessment (60 Marks)	15	15	20	10

**Special Instructions if any: Nil**

**Designed by**

- Mr. Vivek Kshirsagar
- Mrs. Meghana B. Nagori
- Mrs. Vijayshri A. Injamuri

**CS346 : Lab Open Source Software Technology**

**Teaching Scheme**

Practical 2 Hrs/Week  
 Total Credits 1

**Evaluation Scheme**

Term Work 25 Marks  
 Practical/Viva-voce 25 Marks

**Total Hours required for this practical course: 30 Hours.**

**Prerequisite: NIL**

**Course Educational Objectives:**

- Demonstrate different open source technology like Linux, PHP & MySQL with different packages.
- Illustrate Linux commands for programming.
- Explore programs of PHP with MySQL connection

**Course Outcomes Expected:**

After completion of this course students will be able to:

- CO1: Explore different open source technology like Linux, PHP & MySQL with different packages.
- CO2: Execute Linux commands for programming.
- CO3: Execute programs of PHP with MySQL connection

The term work shall consist of following practical/assignments/mini-project/visit\* based on following Theory

**UNIT-1 Open Source and Linux**

Open Source Definition, The distribution terms of open source software, open source technology importance Free and open Source Software (FOSS), LAMP(Linux, Apache, MySQL, PHP, Python, and Perl) Benefits , Perspective of Open Source software Linux and Open Source, Linux Usage Basics: Logging into the system, changing users and editing text files. Running Commands and Getting Help. Browsing the File system, Users, Groups and Permissions.

**UNIT-2 Apache and PHP**

Introduction to Web server. Installing Apache on Linux: httpd service.  
PHP : Testing Installation. Basics of PHP scripts, Variables, Datatypes, Operators and Expressions, Constants , Flow control functions, If statement, Loops, Arrays, Strings, Dates and Times, Forms

**UNIT-3 MySQL Server and Application**

MySQL Server: Configuring MySQL Server, working with MySQL Databases, MySQL Tables, SQL Standards-INSERT, SELECT, UPDATE, REPLACE, DELETE. Date and Time functions in MySQL.  
PHP-MySQL Application Development: Connecting to MySQL with PHP, Inserting data with PHP, Retrieving data with PHP. Developing PHP scripts for dynamic web page like Feedback form, online admission form online test.

**TEXT AND REFERENCE BOOKS**

1. Red Hat Linux Bible by Christopher Negus. Wiley Publishing  
ISBN: 0-7645-4333-4
2. PHP, MySQL and Apache by Julie C Meloni. Pearson Education  
ISBN: 81-297-0443-9

3. The Complete Reference Linux by Peterson . Tata McGRAW HILL  
ISBN:0-07-044489-7
4. UNIX using Linux by Jack Dent, Tony Gaddis. Course Technology (Thomson Learning)  
ISBN:981-240-218-7

**Internet Resources:**

1. <http://opensource.org/>
2. <http://www-128.ibm.com/developerworks/opensource/newto/>
3. <http://www.sun.com/software/opensource/>
4. <http://www.linux.org/lessons/beginner/>
5. <http://www.linux.org/lessons/interm/index.html>
6. <http://www.php.net/tut.php>

**Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			H						H	H		
CO2			H						H	H		
CO3			H						H	H		

**1 – High    2 – Medium    3 - Low**

**Assessment Table**

Assessment Tool	S1	S2	S3
	CO1	CO2	CO3
Term Work (25 Marks)	5	10	10
Practical Examination & Viva Voce (25 Marks)	5	10	10

**Assessment Pattern**

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	05
S2	Manipulation	10	10
S3	Precision	10	10
S4	Articulation		
S5	Naturalization		
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	05	05
Conduct of Experiment (S2)	05	05
Observation and Analysis of Results (S3)	05	05
Record (S2)	05	05
Mini-Project / Presentation/ Viva-Voce (S3)	05	05
<b>Total</b>	<b>25</b>	<b>25</b>

## Special Instructions if any: Nil

### Designed by

- Mrs. Arjumand M. Khan
- Mrs. Pallavi V. Kulkarni
- Mr. Prashant Pathak

## CS 347 : Lab - Design & Analysis of Algorithms

### Teaching Scheme

Practical 2 Hrs/Week  
Credits 1

### Evaluation Scheme

Term Work 25 Marks  
Practical/Viva-voce 25 Marks

**Total Hours required for this practical course: 30 Hours.**

**Prerequisite:** Programming Language  
Data structures  
Discrete Mathematical structures

### Course Outcomes:

After completion of this course students will be able to:

CO1	Design and implement appropriate data structures for computation
CO2	Demonstrate algorithms using divide and conquer approach
CO3	Solve problems using greedy method.
CO4	Employ dynamic programming techniques.
CO5	Problem solving Using backtracking techniques

The term work shall consist of following practical/assignments/mini-project/visit\*

1	Recursive and non-recursive algorithm for specific problem and there complexity measures
2	Implement merge sort using divide and conquer approach.
3	Write a program for finding an element Using Binary Search.
4	Write a Program for Greedy Knapsack problem.
5	Minimal spanning trees using Prime's algorithm.
6	Minimal spanning trees using Kruskal's algorithm
7	Find single source shortest path for multistage graph problem
8	Find all pairs shortest path for multistage graph problem.
9	Huffman code problem.
10	Flow shop scheduling or knapsack's problem or 8 Queen problem

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M										
CO2		M	M		H							
CO3		H	H		H							

CO4		H	H		H							
CO5		H	H		H							

**1 – High    2 – Medium    3 - Low**

**Assessment Table**

Assessment Tool	S1	S2	S2	S2	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	05	05	05	05	05
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05

**Assessment Pattern**

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	00	00
S5	Naturalization	00	00
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	04	05
Conduct of Experiment (S2)	04	07
Observation and Analysis of Results (S3)	08	05
Record (S2)	03	03
Mini-Project / Presentation/ Viva-Voce (S3)	06	05
<b>Total</b>	<b>25</b>	<b>25</b>

**Special Instructions if any: Nil**

**Designed by**

- Mr. Sudhir G. Shikalpure
- Mrs. Meghana B. Nagori
- Mrs. Pallavi Kulkarni

**CS 348 : Lab-Programming in Java**

**Teaching Scheme**

Lectures	1 Hrs/Week
Practical	4 Hrs/Week
Total Credits	2

**Evaluation Scheme**

Term Work	50 Marks
Practical/Viva-voce	50 Marks

**Total Hours required for this practical course: 30 Hours.**

**Prerequisites:CS247: Lab Programming Language**

**Course Outcome:**

**After completion of this course student will be able to**

**CO1:**Write and resolve programming problems using Java Language

**CO2:**Build Java Application and Java Applet

**CO3:**Identify Java standard libraries and classes

**CO4:**Understand and utilize Java Graphical User Interface in the program writing.

**CO5:**Develop and write Object Oriented Java Programs.

**Suggestive list of programs.**

1. To study Java EE 6 & Eclipse IDE Lab Exercises
2. To study and implement Multithreading.
3. To study and implement Applets.
4. To study and implement Swings.
5. To study and use networking packages in java.
6. To study and use JDBC classes in java.
7. To study and develop servlets.
8. To study and create Java Server Pages.
9. To study and implement MVC architecture and steps in creating it.
10. To study struts application and steps in creating it.
11. Mini-Project

**Syllabus**

- UNIT-1 The Collection Framework in Java:** Collection Class, Array List & linked list Classes, Inserting elements, HashSet and TreeSet Classes. Algorithm Support to Collection Classes  
**J2EE:** Introduction to Java Enterprise Edition 6, Need for JEE 6, Advantages of JEE 6, Types of Enterprise Architecture, JEE6 Best Practices, Introduction to Eclipse and its Integrated Development Environment
- UNIT-2 Networking in Java:** Java.Net Package, Socket Fundamentals and Sockets in Java, **Java Database Connectivity (JDBC):** Understanding JDBC Classes, Performing CRUD (create, read, update and delete) Operations, Joining, Manipulating Databases with JDBC, Transaction Processing, Stored Procedures
- UNIT-3 Servlets:** Servlet Overview and Architecture, Introduction to Tomcat 7 Servlet container, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources  
**Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries
- UNIT-4 Introduction to MVC architecture and its significance.** Role of Servlets and JSP in

MVC architecture.

**Understanding Struts:** What is Struts? Why Struts, MVC Framework, Building Model Components, Building View Components, Building Controller Components, Installing Struts, Developing Sample Application

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H			H				H			
CO2		H			M				H			
CO3		H			M				H			
CO4		H			H				H			
CO5		H			H				H			

**H – High      M – Medium      L - Low**

### Assessment Table

Assessment Tool	S2	S3	S3	S2
	CO1,CO4	CO2	CO3	CO5
Term Work (50 Marks)	20	10	10	10
Practical Examination & Viva Voce (50 Marks)	20	10	10	10

### Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	06	00
S2	Manipulation	16	20
S3	Precision	20	20
S4	Articulation	08	10
S5	Naturalization	00	00
<b>Total</b>		<b>50</b>	<b>50</b>

Preparation (S1)	06	00
Conduct of Experiment (S2)	08	10
Observation and Analysis of Results (S3)	20	20
Record (S2)	08	10
Mini-Project / Presentation/ Viva-Voce (S4)	08	10
<b>Total</b>	<b>50</b>	<b>50</b>

**Special Instructions if any: Nil**

### Designed by

- Mrs. Madhuri A. Aher
- Mr. Vikul J. Pawar
- Mr. Prashant D. Pathak

## CS349 : Lab Operating System

### Teaching Scheme

Practical        2 Hrs/Week  
Credits         1

### Evaluation Scheme

Team Work        25 Marks  
Practical /Viva-voce    25 Marks

Total Hours required for this practical course: 30 Hours.

Prerequisites: Programming Language, Data Structures

### Course Outcome:

After completion of this course student will be able to

CO1: Exposure to different OS

CO2: Awareness of concepts of multiprogramming, multithreading and multitasking

CO3: Demonstration of memory management algorithms

CO4: Demonstration of file-handling concepts by implementing suitable algorithms.

CO5: Awareness of computational issues, resources in distributed environment.

Suggestive list of experiments:-

- 1) Comparative Study of different operating systems
- 2) Demonstration of multitasking concept.
- 3) Implementing various process creation algorithms(FCFS,SJF and Round-Robin Scheduling)
- 4) Implementation of memory allocation policies.
- 5) Implementing Page replacement algorithms(FIFO,LIFO)
- 6) Implementing segmentation algorithms
- 7) Implementing file-handling algorithms
- 8) Implementing file-handling algorithms
- 9) Implementing file-handling algorithms
- 10) Demonstration of working of distributed OS environment.

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								M				
CO2	M									M		L
CO3		H								H		
CO4		H								H		
CO5								M				

**H – High      M – Medium      L - Low**

## Assessment Table

Assessment Tool	S1	S2	S3	S4	S5
	CO1,CO2	CO3,CO4	CO5		
Term Work (25 Marks)	05	15	05		
Practical Examination & Viva Voce (25 Marks)	05	20			

## Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	05
S2	Manipulation	15	20
S3	Precision	05	00
S4	Articulation	00	00
S5	Naturalization	00	00
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	05	00
Conduct of Experiment (S2)	15	10
Observation and Analysis of Results (S3)	03	00
Record (S3)	02	05
Mini-Project / Presentation/ Viva-Voce (S3)	00	10
<b>Total</b>	<b>25</b>	<b>25</b>

**Special Instructions if any: Nil**

### Designed by

- Mr. Vivek Kshirsagar
- Mrs. Meghana B. Nagori
- Mrs. Vijayshri A. Injamuri

## CS 350 : Computer Networks

### Teaching Scheme

Lectures	3Hrs/Week
Tutorials	1Hrs/Week
Total Credits	4

### Evaluation Scheme

Test	20 Marks
Teacher Assessment	20 Marks
End-Semester Examination	60 Marks

**Total Hours required for this practical course: 30 Hours.**

**Prerequisite:** Data Structures

### Course Description:

This course introduces the architecture, functions, components, and models of the computer networks and Internet. The principles of IP addressing and fundamentals of Ethernet concepts, media,

and operations are introduced. Students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

**Course Educational Objectives:**

- Demonstrate knowledge of principles of computer networking
- Understand details and functionality of layered network architecture
- Know Internet applications and their protocols
- Understanding applications (e.g. Client Server applications, Web Services)
- Describe and use of Multimedia Information

**Course Outcomes Expected:**

After completion of this course student will be able to

- CO1: Describe various protocols, models in Networks
- CO2: Comprehend Network hardware, Media Types (cables, Wireless),
- CO3: Compare UTP, Connectors, and Network interface Card
- CO4: Design, implement and analyze simple computer networks.
- CO5: Apply the different strategies Operations of TCP/UDP, FTP, HTTP, SMTP, SNMP

**UNIT-1 Introduction**

Overview of computer network, Network hardware and software, Reference model- OSI and TCP/IP and their comparison Network layer- Network layer design issues, various routing Algorithms and congestion control algorithms

**UNIT-2 TCP/IP**

TCP/IP architecture, the internet protocols, IPv6, DHCP and Mobile IP, IP addressing, OSPF and BGP, multicast routing, the network layer in ATM networks

**UNIT-3 Transport layer**

The transport services, elements of transport protocols, internet, Transport protocols, ATM –AAL layer protocols, Performance issues

**UNIT-4 The Application layer**

Network security – principle of cryptography, secret key and public key algorithm, digital signature, Domain name system-The DNS name space, resource records, name server, simple network management Protocol –SNMP model, Electronic, mail-architecture and services, Message formats and message transfer, email privacy

**UNIT-5 Multimedia Information and Networking**

Lossless data compression, Video on Demand, Transmission in ATM network, Communication satellites.

**TEXT AND REFERENCE BOOKS**

1. Andrew .S. Tenenbaum, Computer networks, PHI
2. Alberto,Leon Garcia and Indrawidjaja, Communication networks- Fundamental concepts and key architectures, Tata mc-graw hill

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6 23	PO7	PO8	PO9	PO10	PO11	PO12
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CO1	M											
CO2		M										
CO3		H	H									
CO4			H	M								
CO5					H							

### Mapping of Course outcome with Program Outcomes

#### 1 – High2 – Medium3 - Low

**Teacher's Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

- 1) Tutorials
- 2) Problem Solving
- 3) Power point presentation of case studies
- 4) Question & answer / Numerical solution /Simulation

#### Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	05	00	18
K2	Understand	10	05	24
K3	Apply	05	10	12
K4	Analyze	00	05	6
<b>Total Marks 100</b>		20	20	60

#### Assessment table

Assessment Tool	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	10	10	00	00	00
Teachers Assessment (20 Marks)	05	05	05	05	
ESE Assessment (60 Marks)	12	12	12	12	12

**Special Instructions if any: Nil**

#### Designed by

- Mr. Sudhir G. Shikalpure
- Mr. Vivek P. Kshirsagar
- Mr. Prashant pathak

## CS351 Image Processing

Teaching Scheme		Evaluation Scheme	
Lectures	4 Hrs/Week	Test	20 Marks
Tutorials	00	Teacher Assessment	20 Marks
Total Credits	4	End-Semester Examination	60 Marks

**Total Hours required for this course: 60 Hours.**

**Prerequisites:** Mathematics, Programming language.

**Course Description:** Images and visual information are integral parts of our daily lives. Digital image processing plays an important role in various practical applications among them: television, medical imaging modalities such as X-ray or ultrasound, photography, security, astronomy and remote sensing. This subject will introduce the fundamentals of image processing and manipulation. While image applications will be used for illustrations, the subject emphasizes general principles of image processing rather than specific applications. To know and understand how computers can process digital images. To know some of the basic operations (their basis, implementation and consequences) in image processing

### Course Educational Objectives:

- Introduce the scope of field of image processing and basic concepts in digital image processing.
- Demonstrate different of image enhancement techniques.
- Describe different segmentation & compression techniques.
- Analyze different morphological techniques.
- Construct a model for object recognition.

### Course Outcomes Expected:

After completion of this course student will be able to

CO1: Describe the theory and algorithms that are widely used in digital image processing K2

CO2: Apply a proper image enhancement technique for given a set of noisy images. K3

CO3: Compare different image segmentation and compression techniques. K3

CO4: Formulate solutions using morphological concepts. K3

CO5: Develop any application using different image processing techniques. K4

### Detailed Syllabus:

<b>UNIT-1</b>	<b>Digital Image Fundamentals</b> Different fields of DIP, The digitized image and its properties – Image sampling and quantization ,image types, spatial Intensity and resolution, basic relationship between pixels, Mathematical tools used in DIP
<b>UNIT-2</b>	<b>Image Enhancement</b> – Basic Intensity transformation functions, Histogram processing, smoothing and sharpening filters in spatial and frequency domain , Periodic noise. <b>Image Restoration and reconstruction-</b> A model of Image Degradation/ restoration Process, Noise Models, Mean filters, order statistics filters, Adaptive filters, and Notch filters.
<b>UNIT-3</b>	<b>Morphological Image Processing</b> – Erosion & Dilation, Opening & Closing , Hit or Miss Transformation, Boundary Extraction, Thinning, Thickening, Skeletons ,Pruning, Textural segmentation, morphological smoothing.
<b>UNIT-4</b>	<b>Image Segmentation</b> – Fundamentals, Point, line & Edge Detection, Thresholding, basic thresholding, global thresholding, multivariable thresholding, region growing, region splitting

	and merging. <b>Image Compression-</b> Coding redundancy, measuring image information, fidelity criteria, image compression models, Huffman coding, Arithmetic coding, run length coding, symbol based coding, bit plane coding, digital image watermarking.
<b>UNIT-5</b>	<b>Object recognition</b> –Need for object recognition system, automated object recognition system, patterns and pattern class, representation of pattern class, selection of measurement parameters, relationship between image processing and object recognition, approaches to object recognition, Bayes’ parametric classification, Structural method-shape numbers, string matching, Face recognition.
<b>TEXT BOOK :</b>	
1) Digital image processing, by Gonzales Woods 3 <sup>rd</sup> Edition, Pearson Education 2) Digital Image Processing, by S Jayaraman, S Esakkirajan, T Veerakumar TMH Publication	
<b>REFERENCE BOOK:</b>	
1) Fundamental of Digital Image Processing by Anil K. Jain, PHI Pub. 2) Image Processing, Analysis and Machine Vision , by <a href="#">Milan Sonka</a> , <a href="#">Vaclav Hlavac</a> , <a href="#">Roger Boyle</a> Cengage Learning 3 <sup>rd</sup> Edi	

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H										
CO2	H	H										
CO3	H	H		M								
CO4	H	H		H						M		
CO5	H	H		H		M				M		M

**H – High M – Medium L - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

- 1) Question answer based Theoretical Assignment
- 2) Surprise Test
- 3) Power point presentation of any IEEE paper in field of image processing
- 4) Quiz
- 5) Developing Small applications using Matlab.

### Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	10	05	20
K2	Understand	10	05	20
K3	Apply	00	10	20
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00

<b>Total Marks 100</b>	20	20	60
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### Assessment table

Assessment Tool	K2	K3	K3	K3	K4
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	10	10	00	00	00
Teachers Assessment (20 Marks)	05	05	00	05	05
ESE Assessment (60 Marks)	20	20	10	10	00

**Special Instructions if any: Nil**

#### Designed by

- Mrs. Vrushali A. Chakkarwar
- Mr. Vikul J. Pawar
- Mr. Prashant D. Pathak

### CS352: System Programming and Compiler Construction

#### Teaching Scheme

Lectures	3 Hrs/Week
Tutorials	1Hrs/Week
Total Credits	4

#### Evaluation Scheme

Test	20 Marks
Teacher Assessment	20 Marks
End-Semester Examination	60 Marks

**Total Hours required for this course: 60 Hours.**

**Prerequisites:** Discrete Mathematical Structure

Theory of Computation

**Course Description:** This course gives the introduction to system programming and compiler construction. It also gives the knowledge role of a lexical analyzer, specification of tokens, recognition of tokens, Lexical analyzer generator LEX, role of parser, context free grammars, eliminating ambiguity, eliminating left recursion, Top-Down parser. This course also gives the idea about Syntax Directed Translation and Intermediate Code Generation using different technique such as DAG, Three address code, etc. At the end this course gives the information runtime environment and issues in code generation.

#### Course Educational Objectives:

- Describe the utility of different system programs & system tools.
- Familiarize with the tradeoffs between run-time and compile-time processing (Linking & Loading techniques).
- Explore the use of compiler with its phases.
- Use of Syntax directed scheme for intermediate code generation.
- Construct & use of different compiler tools as LeX, Yacc for code generation & optimization.

#### Course Outcomes Expected:

After completion of this course student will be able to

CO1: Organize the functionalities & components of system software & tools into different layers for efficient code generation.

CO2: Apply the knowledge & technique to develop solutions to real world problems by compiling application programs.

CO3: ability to identify, formulate, and solve computer engineering problems with proper systematic & semantic approach.

CO4: Develop possible program constructs for further code generation with Type checking & memory management strategy

CO5: Design a simple compiler with tools & different with optimized techniques

#### **UNIT-1 Introduction to System programming.**

Components of System s/w , Language processors, Assemblers, Macro processor , Compilers, Interpreters, Device drivers.

#### **UNIT-2 Loaders and Linkers.**

Loaders:- Basic loader functions ,Compiler & go loader, design of absolute loader , design of direct linking loader.

Linker:- Linking & relocation concept, design of a linker ,static & dynamic linking loader, self relocating programs, editors.

#### **UNIT-3 Lexical Analyzer and Syntax Analyzer.**

Lexical Analyzer:- Role of a lexical analyzer, specification of tokens, recognition of tokens, Lexical analyzer generator LEX.

Syntax Analyzer:- Role of Parser, Context free grammars, eliminating ambiguity, eliminating left recursion, Top Down parser(recursive descent parsing & no recursive descent parsing, Bottom Up parser, handle pruning, Shift reduce parsing, LR parser, LR parsing algorithm, SLR,LALR parser, Parser generators ( YACC & BISON)

#### **UNIT-4 Syntax Directed Translation and Intermediate Code Generation.**

Syntax Directed definition, construction of syntax trees, dependency graph S-attributes & L-attributes evaluation, Symbol table structure, attributes & management.

Intermediate language structure, DAG's Three address code, intermediate code for Boolean expression, procedure calls ,control stmt's', Switch stmt's, Type checking

#### **UNIT-5 Runtime Environment and Code Generation.**

Static & Dynamic storage allocation, Introduction to garbage collection, parameter passing, returning values.

Code generation:- Issues in code generation, target language, Basic blocks, Flow graphs, Simple code generator, optimization of basic blocks, peephole optimization, machine dependent & Independent optimization.

#### **TEXT BOOKS**

1. A.V. Aho,Ullman&Sethi "Compilers –Principles, tools & technique" Dragon book. Pearson.
2. D.M.Dhamdere " System programming & Operating systems"TMH

#### **REFERENCE BOOKS**

3. John.R Levine " Linkers &Loaders" Morgan Kaufman

4. John.R Levine ,T.mason, D brown “ Lex &Yacc “, O Reilly,2000
5. S.Chattopadhyaya, “ Comiler design” PHI
6. Andrew w.Appel, “Modern Compiler Implementation in C/Java”,Cambridge university Press.

### Assessment Pattern

Assessment Pattern Level No.	Knowledge Level(According to Blooms Revised Taxonomy)	Test	Tech. Quiz	Assignment	Case study	Presenta tion	End Semester Examination *
K2	Understand	20					20
K3	Apply		05			05	40
K4	Analyze				05		
K6	Create			05			
<b>Total</b>		20			20		60

### CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M								H			
CO2	M		H									
CO3	M									H		
CO4		H	M									
CO5					H							

High-H      Medium-M      Low-L

Assessment Tool	K2	K3	K4	K5	K6
	CO1	CO2	CO3	CO4	CO5
Class Test (20 Marks)	10	10	00	00	00
Teachers Assessment (20 Marks)	02	03	05	05	05
ESE Assessment (60 Marks)	12	12	16	15	05

**Special Instructions if any: Nil**

#### Designed by

- Mrs. Arjumand M. Khan
- Mr. Vikul J. Pawar
- Mrs. Pallavikulkarni

### CS353: Data Mining & Warehousing

#### Teaching Scheme

Lectures	3 Hrs/Week
Tutorials	1 Hrs/Week
Total Credits	4

#### Evaluation Scheme

Test	20 Marks
Teacher Assessment	20 Marks
End-Semester Examination	60 Marks

**Total Hours required for this course: 60 Hours.**

**Prerequisites:** Discrete Mathematical Structure  
Database Management System  
Engineering Mathematics

**Course Educational Objectives:**

- Explain the purpose for developing a data warehouse.
- Describe and use the dimensional modeling techniques.
- Use OLAP analysis with contemporary analysis and visualization tools.
- Understand the purpose of data mining and knowledge discovery process.
- Understand several different data mining techniques such as market basket analysis, Clustering, classification.

**Course Outcomes Expected:**

After completion of this course student will be able to

CO1: Identify the subject areas for which a data warehouse is to be built.

CO2: Design a dimensional model for data warehouse.

CO3: Analyze the market needs by applying suitable OLAP operations.

CO4: Identify the patterns that can be extracted on application of data mining techniques in various domains.

CO5: Develop an application by using various data mining techniques to identify patterns that evolve in various business domains.

**UNIT-1 DATA WAREHOUSING**

Data warehousing Components –Building a Data warehouse, Dimensional modeling, Star and snowflake Schemas for Decision Support, Data Extraction, Clean-up, and Transformation Tools, Metadata, Data warehouse users

**UNIT-2 BUSINESS ANALYSIS**

Reporting and Query tools and Applications, Visualization tools, Online Analytical Processing (OLAP), Need for Multidimensional Data Model, OLAP Operations and tools.

**UNIT-3 DATA MINING**

Introduction, Types of Data, Data Mining Functionalities, Classification of Data Mining Systems, Data Mining Task Primitives, Data Pre-processing.

**UNIT-4 ASSOCIATION RULE MINING AND CLASSIFICATION**

Mining Frequent Patterns, Associations and Correlations, Classification and Prediction - Basic Concepts, Decision Tree, Bayesian Classification, cluster Analysis, Types of Data, Categorization of Major Clustering Methods Partitioning Methods, Hierarchical Methods Grid Based Methods, Outlier Analysis, and Data Mining Applications.

**UNIT-5 MODEL EVALUATION AND ADVANCED TECHNIQUES**

Basic issues, Training and testing, Estimating classifier accuracy (holdout, cross-validation, and leave-one-out), Combining multiple models (bagging, boosting, stacking), Text mining: extracting attributes (keywords), Bayesian approach to classifying text, Web mining: classifying web pages, Extracting knowledge from the web.

**TEXT BOOKS:-**

1. Jiawei Han and MichelineKamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier, 2007.
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

**REFERENCE BOOKS:-**

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction To Data Mining”, Person Education, 2007.
2. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

**Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				H								
CO2			H									
CO3										H		
CO4				H								
CO5			M									M

**H – High M – Medium L - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on the following :-

- 1) Quiz/Multiple Choice questions test
- 2) Tutorial assessments
- 3) Powerpoint Presentations
- 4) Case Studies

**Assessment Pattern**

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	04		10
K2	Understand	06		20
K3	Apply	10	05	20
K4	Analyze	00	05	00
K5	Evaluate	00	05	10
K6	Create	00	05	00
<b>Total Marks 100</b>		20	20	60

### Assessment table

Assessment Tool	K1	K2	K3	K4
		CO1,CO2	CO4	CO3,CO5
Class Test (20 Marks)				
Teachers Assessment (20 Marks)				
ESE Assessment (60 Marks)				

### Special Instructions if any: Nil

#### Designed by

- Mrs. Meghana B. Nagori
- Mrs. Pallavi V. Kulkarni
- Mrs. Vrushali Chakkarwar

CS 354: Professional Ethics and Cyber Laws	
<b>Teaching Scheme</b> Lectures: 4 Hrs/Week	<b>Examination Scheme</b> Test : 20 Marks Teachers Assessment : 20 Marks End Semester Exam : 60 Marks

### Prerequisites: Basic Computer and Internet

**Course description:** This course will introduce concepts of Professional and Philosophical Ethics amongst the students; it will summarize Cyber Crimes and its associated investigation and forensics with relation to Cyber law. Students will have a new dimension to look towards their day to day computer activities.

### Course Objectives:

- Describe Professional & Philosophical Ethics
- Describe the process of Securing Intellectual Property
- Enable Students on how to Recover the Evidence and Investigation
- Demonstrate on how to secure own presence online
- Describe Cyber Law provision related to all type cyber crimes

### Course Outcomes

After completion of this course student will be able to

CO1	Apply Philosophical and Professional Ethics to solve Ethical Dilemma & identify their Professional Responsibilities
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CO2	Examine Intellectual Property Rights in Cyber space
CO3	Summarize Cyber Forensics and its role in Cyber Laws
CO4	Evaluate Cyber Crimes and its severity, and measures for Incident detection and response
CO5	Describe Scope, jurisdiction, offense and contraventions, powers of police, adjudication

**Detailed Syllabus:**

Unit 1	<p><b>Computer and Philosophical ethics:</b></p> <p>Moral v/s Ethics, Why Computer Ethics, Philosophical Ethics: Distinguishing Descriptive and Normative Claims, Ethical Relativism, Utilitarianism, Deontological Theories, Rights, Virtue Ethics, Professional Ethics: Why Professional Ethics, Characteristics of Professionals, The System of Professionals, is Computing a Profession., Professional Relationships, Code of Ethics and Professional Conduct, Steps in Ethical Decision Making</p>
Unit 2	<p><b>Ethics &amp; Internet:</b> Three Morally Significant Characteristics, Hacking &amp; Hacker Ethics, Netiquette  <b>Intellectual property issues in cyberspace :</b> Introduction to intellectual property Protections via Trade Secrets, Trademarks, Patents, Etc. Contracting to protect intellectual property, Protection options - Encryption / PGP, copyright on web-content, Copyright on software, digital contracts, digital signatures</p>
Unit 3	<p><b>Data and Evidence Recovery-</b> Introduction to Deleted File Recovery, Formatted Partition Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files, Introduction to Encase Forensic Edition, Forensic Tool Kit (FTK) etc, Use computer forensics software tools to cross validate findings in computer evidence-related cases.</p> <p><b>Cyber Forensics Investigation-</b> Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking</p>
Unit 4	<p><b>Cyber Security-</b> Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Types of incidents, Stages of incident response Threats in cyberspace, Blended attacks, , incident prevention and detection, Forming an Incident Response Team, Reporting Cyber crime, Operating System Attacks, Application Attacks, Reverse Engineering</p>

	&Cracking Techniques and Financial Frauds
Unit 5	<b>Information technology Act 2000</b> :Scope, jurisdiction, offense and contraventions, powers of police, adjudication

### Text Books & Reference Books

1. *Computers, Ethics, And Social Values*, Johnson and Nissenbaum, 1994 Prentice Hall
2. *Cyber security operations Handbook*, John Rittinghouse, William Hancock
3. *Computer ethics*, Deborah G.Johnson, third edition, Pearson education

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L			H	H					M	H
CO2	L	L			H	H		M		M		H
CO3			M	M								M
CO4			M									
CO5			M	M				M		M		M

**1 – High 2 – Medium 3 - Low**

**Teacher’s Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

- 1) Attendance
- 2) Cryptographic Example Solving
- 3) Power point presentation of case studies
- 4) Question & answer / Numerical solution

### Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	05	00	15
K2	Understand	10	05	20

K3	Apply	05	10	15
K4	Analyze	00	05	10
K5	Evaluate	00	00	00
K6	Create	00	00	00
<b>Total Marks 100</b>		20	20	60

### Assessment table

Assessment Tool	K1	K2	K4	K3	K2
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	05	10	00	05	00
Teachers Assessment (20 Marks)	00	00	05	10	05
ESE Assessment (60 Marks)	15	20	10	15	00

### Special Instructions if any: Nil

#### Designed by

- Mr. Prashant D. Pathak
- Mrs. Meghana Nagori
- Mr. Vivek Kshirsagar

CS 355: LAB: Application Development Tools	
<b>Teaching Scheme</b> <b>Lectures: 1 Hrs/Week</b>	<b>Examination Scheme</b> <b>Term Work : 25 Marks</b> <b>Practical /Viva : 25 Marks</b>

### Prerequisites: HTML, CSS

**Course description:** This course aims at developing skill amongst students in area of Web Based application development using ASP.NET, C#, Ajax etc.

### Course Objectives:

- Explain .NET Framework and introduce its IDE to create Presentation Layer
- Explain basic concepts in C# and introduce important file and folders in C#
- Enable Students on how to use Standard and Validation Controls
- Demonstrate on various ways of interacting with Database
- Demonstrate use of AJAX and Web Services

### Course Outcomes

After completion of this course student will be able to

CO1	Develop presentation layer for their web application
CO2	Differentiate and Use proper files and folders to address situation
CO3	Implement the Standard and Validation Controls
CO4	Connect with Database and Manage it
CO5	Implement AJAX and Web Services

### Detailed Syllabus:

Unit 1	<p><b>Getting Started with .NET:</b> Introduction to .NET Framework and Visual Studio.NET, Kind of Applications that can be developed using Visual Studio.NET, Website v/s Web Application, Creating a new sample Web Project with Visual Studio</p> <p><b>Creating Presentation Layer:</b> Creating Front-End with the HTML &amp; CSS, Grid Layout v/s Liquid Layout, using Cascaded Style Sheets</p>
Unit 2	<p><b>Introduction to C#:</b> Working with Variables, Data Types, Data Type Conversion, Operators and Expressions, Creating Classes and Objects in C#, Using Namespaces, Arrays, Exception Handling in C#, Navigating amongst Web Pages, Event Handling</p> <p><b>Important Files and Folders in Web Application:</b> All System Folders, Web.Config, Global.asax, Building sites with Master Pages, Using User Controls</p>
Unit 3	<p><b>Building ASP.NET Pages:</b> Standard Controls, Validation Controls,</p> <p><b>State Management:</b> ASP.NETPageLife Cycle, Session Management, Managing Query String, View State in C#</p>
Unit 4	<p><b>Working with Data:</b> ADO.NET Architecture, Connected &amp; Disconnected Architectures, SQL Connection, SQL Command &amp; important Classes for operating database related operations (CRUD), Using Datasets &amp; Data Adapters</p> <p><b>Working with Data Controls:</b> Grid View, Repeater Control</p>
Unit 5	<p><b>AJAX:</b> Ajax Architecture, Script Manager, Update Panel, Ajax Control Toolkit</p>

	<b>Web Services:</b> Creating and Consuming Web Services <b>Deploying ASP.NET Websites:</b> Installing and configuring website using IIS
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### Text Books

1. The Complete Reference ASP.NET
2. The Complete Reference C#

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M				M			M	M	
CO2			H				H			H	M	
CO3			H				H			H	M	
CO4			H				H			H	M	
CO5			H				H			H	M	

1 – High 2 – Medium 3 - Low

### List of Experiments

Sr. No.	Details
1	To Study the ASP.Net Framework
2	To Study & Create Presentation Layer using HTML & CSS
3	To Study & Create Master Page, User Control etc
4	To Study & Use Standard Controls in ASP.NET
5	To Study & Use Validation Controls in ASP.NET
6	To Study, Create and Connect with Database using ASP.NET & SQL Server
7	To Study & Implement Web Services
8	To Study & Implement AJAX in ASP.NET
9	To Study & Deploy Project on IIS
10	Mini Project

### Assessment Table

Assessment Tool	S1	S2	S3	S3	S2
	CO1	CO2	CO3	CO4	CO5

Term Work (25 Marks)	07	07	05	03	03
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05

### Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	05
S2	Manipulation	08	10
S3	Precision	12	10
S4	Articulation	00	00
S5	Naturalization	00	00
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	04	05
Conduct of Experiment (S2)	04	07
Observation and Analysis of Results (S3)	08	05
Record (S2)	03	03
Mini-Project / Presentation/ Viva-Voce (S3)	06	05
<b>Total</b>	<b>25</b>	<b>25</b>

**Special Instructions if any: Nil**

#### Designed by

- Mr. Prashant D. Pathak
- Mr. Nauman Pathan
- Mr. Vikul J. Pawar

### CS 356 : Lab Computer Network

#### Teaching Scheme

Practical 2Hrs/Week  
Credit 1

#### Evaluation Scheme

Term Work 25 Marks  
Practical/Viva-voce 25 Marks

**Prerequisites:** Data structures

#### Course Outcomes:

After completion of this course student will be able to

CO1	Recognize the different internetworking devices and their functions.
CO2	Role of protocols in networking.

CO3	Design and apply subnet masks and addresses to fulfill networking requirements.
CO4	Features of TCP/IP Protocol
CO5	Analyze the features and operations of various application layer protocols such as Http, DNS

The term work shall consist of following practical

1	Introduction to Networking Devices
2	Understanding / Illustrate the network features of peer to peer network .
3	Understanding / Illustrate the network features of Client Server network .
4	Build a Category 5 or Category 6 Unshielded Twisted Pair (UTP) Ethernet crossover cable
5	Connecting 2 Computers together using a Crossover cable
6	Configure TCP/IP in LAN
7	File Transfer / Sharing/ Virtual Desktop Access
8	Study of basic network command and Network configuration commands.
9	Program for simple RSA algorithm to encrypt and decrypt the data.
10	Client/Server chat application

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M										
CO2		M	M		H							
CO3		H	H		H							
CO4		H	H		H							
CO5		H	H		H							

**1 – High    2 – Medium    3 - Low**

### Assessment Table

Assessment Tool	S1	S2	S2	S2	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	05	05	05	05	05
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05

### Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	00	00
S5	Naturalization	00	00
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	04	05
Conduct of Experiment (S2)	04	07
Observation and Analysis of Results (S3)	08	05
Record (S2)	03	03
Mini-Project / Presentation/ Viva-Voce (S3)	06	05
Total	<b>25</b>	<b>25</b>

**Special Instructions if any: Nil**

**Designed by**

- Mr. Sudhir G. Shikalpure
- Mr. Vivek P. Kshirsagar
- Mr. Prashant Pathak

**CS 357 Lab Image Processing**

**Teaching Scheme**

Practical      2 Hrs/Week  
Credit          1

**Evaluation Scheme**

Term Work        : 25 Marks  
Practical/Viva-voce: 25 Marks

**Total Hours required for this practical course: 30 Hours.**

**Prerequisite:** Programming Language

**Course Outcomes Expected:**

After completion of this course student will be able to

- CO1: Perform image related operations. K2
- CO2: Apply a proper filter for given a set of noisy images. K3
- CO3: Analyse different image segmentation and compression techniques. K3
- CO4: Demonstrate different morphological operations. K4
- CO5: Develop any application using different image processing techniques. K4

Suggestive list of practical is

Sr. No.	TITLE
1	To study Mat lab toolbox.
2	To perform simple arithmetic operations on images.
3	To implement program for image enhancement using histogram equalization.
4.1	To study and implement the program addition of different type of noise's to images.
4.2	To study and implement program of low pass and high pass filter using Gaussian filter.
5	To implement program of the edge detection using different type of method
6	To implement program to perform different morphological operations on images and reduce noise using morphological operations in images.

7	To study and implement program of the different type of texture effect on images.
8	To study and implement a program to detect a cell using image segmentation.
9	To study and implement the program of bit plane coding.
10	To study and implementation of wavelet-based watermarking.

The list is indicative only. Scope of the subject should not be limited to the same.

**Reference Book:**

1. Rafael C. Gonzalez , Richard E. Woods, Steven L. Ed ,Digital Image Processing Using MATLAB, 2nd ed, Gatesmark publishing.

**Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		M								
CO2	H	H		M								
CO3	H	H		M								
CO4	H	H		M								
CO5	H	H		M								M

**H – High      M – Medium      L - Low**

**Assessment Table**

Assessment Tool	S1	S2	S2	S3	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	03	05	05	06	06
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05

**Assessment Pattern**

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	03	05
S2	Manipulation	10	10
S3	Precision	12	10
S4	Articulation	00	00
S5	Naturalization	00	00
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	04	05
Conduct of Experiment (S2)	04	07
Observation and Analysis of Results (S3)	08	05
Record (S2)	03	03
Mini-Project / Presentation/ Viva-Voce (S3)	06	05
<b>Total</b>	<b>25</b>	<b>25</b>

## Special Instructions if any: Nil

### Designed by

- Mrs. Vrushali A. Chakkarwar
- Mr. Vikul J. Pawar
- Mr. Prashant D. Pathak

## CS358: Lab Data Mining and Warehousing

### Teaching Scheme

Practical	2 Hrs/Week
Credits	1

### Evaluation Scheme

Team Work	25 Marks
Practical /Viva-voce	25 Marks

Total Hours required for this practical course: 30 Hours.

Prerequisites:

### Course Outcome:

After completion of this course student will be able to

CO1: Demonstrate the use of weka tool

CO2: Identify big data analytics domains and collect relevant data for analysis.

CO3: Awareness of various performance metrics for evaluation of data mining techniques

CO4: Effective Presentation of solutions to problems by choosing appropriate visualization tools.

CO5: Design a application from any suitable domain by incorporating all the core concepts

Suggestive list of programs.

1. Installation and Comparative analysis of various mining tools.
2. Implement OLAP operations and schema using MS-Access and MS-Excel
3. Construct .arff and .csv file and import them in Weka.
4. Explore different visualization tools.
5. Explore different pre-processing options of WEKA tool.
6. Demonstrate the concept of association rule mining with Apriori algorithm
7. Implement the following clustering techniques:-
  1. Hierarchical Clustering
  2. K-means Clustering
8. Implement the following classification algorithms:-
  1. J48
  2. CART
  3. Random tree
9. Demonstrate statistical analysis with Naïve-Bayes Classifier
10. Evaluation of data-mining techniques with different performance metrics
11. Demonstrating Text mining by selecting appropriate data mining technique.
12. Mini Project by performing the following on any domain of the students choice:-
  - Schema design

OLAP operations  
 Preprocessing of data  
 Application of suitable data mining technique  
 Evaluation by various performance metrics  
 Presentation of results by using visualization technique.

### Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										H		
CO2				H								
CO3	M											
CO4						M						
CO5											M	H

**H – High    M – Medium    L - Low**

### Assessment Table

Assessment Tool	S1	S2	S3	S4	S5
		C01,CO2	CO3	CO4	CO5
Term Work (25 Marks)		5	6	6	8
Practical Examination & Viva Voce (25 Marks)		10	05	05	05

### Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	00	00
S2	Manipulation	05	10
S3	Precision	6	05
S4	Articulation	6	05
S5	Naturalization	08	05
<b>Total</b>		<b>25</b>	<b>25</b>

Preparation (S1)	02	00
Conduct of Experiment (S2)	07	06
Observation and Analysis of Results (S3)	04	06
Record (S3)	02	03
Mini-Project / Presentation/ Viva-Voce (S5)	10	10
<b>Total</b>	<b>25</b>	<b>25</b>

**Special Instructions if any: Nil**

### Designed by

- Mrs. Meghana B. Nagori
- Mrs. Pallavi V. Kulkarni
- Mrs.Vrushali ChakKarwar

